Session 8: Review Exercises

AY2025/26 Term 1

Question 1: State true or false, with explanation.

(a) If we define a stochastic trend as a random walk without drift, then a random walk with drift is a linear deterministic trend plus a stochastic trend.

(b) When using seasonal dummies in a regression with intercept, one must always leave out the first seasonal dummy variable.

(c) The following models are equivalent

i. $Y_t = \beta_0 + \beta_1 Y_{t-1} + \epsilon_t\,,\ |\beta_1| < 1\,,\ \epsilon \overset{iid}{\sim} (0, \sigma^2)$

ii. $Y_t = c + u_t\,,\ u_t = \rho u_{t-1} + \epsilon_t\,,\ |\rho| < 1\,,\ \epsilon \overset{iid}{\sim} (0, \sigma^2)$

iii. $(Y_t - \gamma_0) = \gamma_1 (Y_{t-1} - \gamma_0) + \epsilon_t\,,\ |\gamma_1| < 1\,,\ \epsilon \overset{iid}{\sim} (0, \sigma^2)$

Question 2: What feature of time series do the models in Question 1(c) describe?

Question 3: Show that the following two models are equivalent:

i. $Y_t = \alpha + \delta t + u_t\,,\ u_t = \rho u_{t-1} + \epsilon_t\,,\ |\rho| < 1\,,\ \epsilon \overset{iid}{\sim} (0, \sigma^2)$

ii. $Y_t = \beta_0 + \beta_1 t + \beta_2 Y_{t-1} + \epsilon_t\,,\ |\beta_2| < 1\,,\ \epsilon \overset{iid}{\sim} (0, \sigma^2)$

What feature of time series do the models describe?